

Newton's 2nd Law: True or False

Name _____ Class _____ Date _____

Determine if the following statements are true or false.

- _____ 1. The relationship between mass and inertia is described by Newton's second law of motion.
- _____ 2. Newton determined that there is a direct relationship between force and mass.
- _____ 3. Any change in velocity for any reason is called acceleration.
- _____ 4. The greater the net force applied to a given object, the more it will accelerate.
- _____ 5. The greater the mass of an object, the more it will accelerate when a given net force is applied to it.
- _____ 6. A net force of 1 N applied to a mass of 1 kg results in an acceleration of 0.5 m/s.
- _____ 7. Your weight equals your mass multiplied by the acceleration due to gravity.
- _____ 8. A 10-kg object has greater acceleration due to gravity than a 5-kg object.
- _____ 9. The acceleration of an object equals its mass times the net force applied to it.
- _____ 10. The acceleration of an object due to gravity depends on the object's initial velocity

Critical Reading

Read this passage from the text and answer the questions that follow.

Acceleration and Weight

Newton's second law of motion explains the weight of objects. Weight is a measure of the force of gravity pulling on an object of a given mass. It's the force (F) in the acceleration equation that was introduced above: $a = \frac{F}{m}$

This equation can also be written as: $F = m \times a$

The acceleration due to gravity of an object equals 9.8 m/s, so if you know the mass of an object, you can calculate its weight as: $F = m \times 9.8 \text{ m/s}^2$

As this equation shows, weight is directly related to mass. As an object's mass increases, so does its weight. For example, if mass doubles, weight doubles as well.

Questions

1. Define weight.
2. How is the weight of an object related to its mass?
3. If an object has a mass of 50 kg, what is its weight?

Multiple Choice

Circle the letter of the correct choice.

1. An object is accelerating when it
 - a. speeds up.
 - b. slows down.
 - c. changes direction.
 - d. any of the above
2. Newton's second law of motion relates an object's acceleration to
 - a. its mass.
 - b. its velocity.
 - c. the net force acting on it.
 - d. two of the above
3. Doubling the net force acting on an object
 - a. doubles its acceleration.
 - b. decreases its acceleration.
 - c. cuts its acceleration in half.
 - d. does not affect its acceleration.
4. If you push a 20-kilogram mass with a force of 40 N, what will be the object's acceleration?
 - a. 40 m/s
 - b. 20 m/s
 - c. 10 m/s
 - d. 2 m/s

5. Which units can be used to express force?
- a. N
 - b. kg/s
 - c. kg • m/s
 - d. two of the above
6. If you know the mass of an object, you can calculate its weight with the formula
- a. $F = m \times V$
 - b. $a = F/m$
 - c. $F = m \times 9.8 \text{ m/s}^2$
 - d. $d = v \times t$
7. If the mass of an object doubles, its weight
- a. doubles.
 - b. decreases.
 - c. is not affected.
 - d. changes by a factor of $\frac{1}{2}$.

Matching

Match each definition with the correct term.

Definitions

- _____ 1. acceleration due to gravity
- _____ 2. formula for weight
- _____ 3. formula for acceleration
- _____ 4. measure of the force of gravity pulling on an object
- _____ 5. type of relationship between acceleration and mass
- _____ 6. measure of the change in velocity of a moving object
- _____ 7. type of relationship between acceleration and force

Terms

- a. acceleration
- b. weight
- c. direct relationship
- d. $a = \frac{F}{m}$

e. inverse relationship

f. $F = m \times a$

g. 9.8 m/s

Fill in the Blank

Fill in the blank with the appropriate term.

1. _____ occurs whenever an object is acted upon by an unbalanced force.
2. The acceleration of an object is determined by the net force acting on the object and the object's _____.
3. Newton's second law of motion shows that there is a direct relationship between acceleration and _____.
4. One newton is the force needed to cause a 1-kilogram mass to accelerate at _____.
5. There is a(n) _____ relationship between an object's weight and its mass.
6. To calculate weight from acceleration and mass, mass must be expressed in _____.
7. An object's acceleration is zero when the net force acting on the object is _____.

Critical Writing

Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.

Explain how Newton's second law of motion can be used to calculate the acceleration of an object.